



Wastewater Best Management Practices for Breweries

January 2020

Protecting the sewer system – and your bottom line

The New Hampshire Department of Environmental Services (NHDES) works with industries to make sure their wastewater is properly treated and meets the requirements of their local Wastewater Treatment Facilities (WWTFs).

To help breweries meet requirements and manage costs, we are providing these Best Management Practices, activities, procedures and features designed to minimize pollutants discharged to the sanitary sewer or released to the environment.

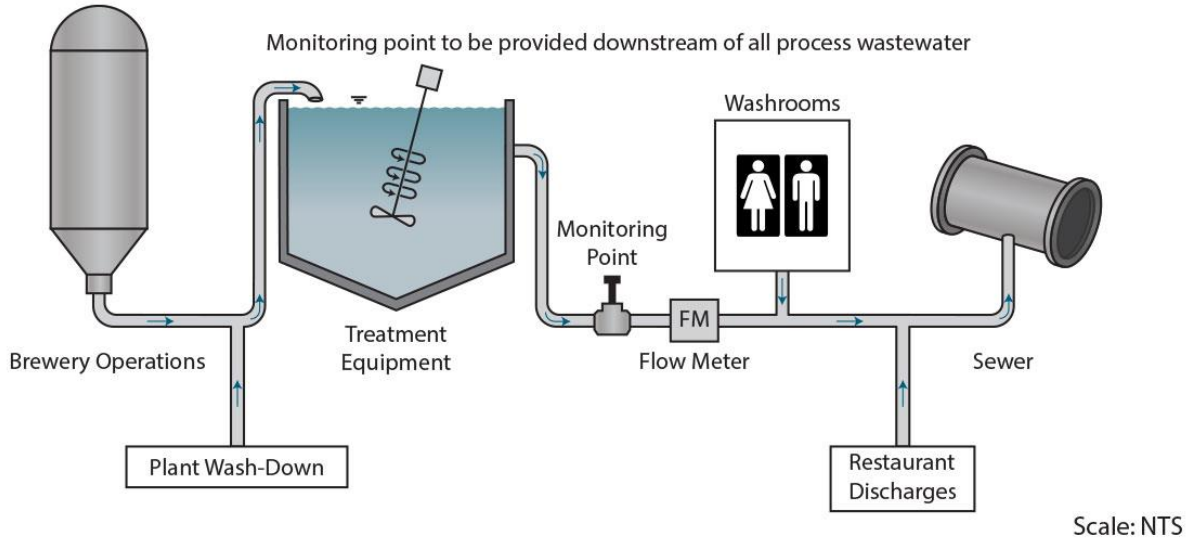
The Requirements

- 1. Meet discharge limits:** All breweries that send their wastewater to the sewer system must make sure their wastewater meets local discharge limits and prohibitions. Different WWTFs often have different requirements. Contact your WWTF to determine what requirements apply to you.
 - **Total Suspended Solids (TSS):** Solids such as spent yeast, grains, hops and trub capable of settling can restrict or block flow in sewer lines. A company or facility that discharges solids which cause a sewage backup is liable for any damages.
 - **Biochemical Oxygen Demand (BOD):** Beer and brewery wastewater has VERY high BOD on the order of 60,000 mg/l compared to domestic sewage from a house which is ~300 mg/l. The sugar and alcohol, as well as spent yeast, grains, hops and trub contribute to BOD. Some WWTFs are adding costly surcharges to manage their costs associated with treating BOD. Check with your WWTF for limits.
 - **pH:** The pH of wastewater must typically remain between 5.0 and 12.5 (check with your WWTF for specific limits). Wastewater that is too acidic (low pH) or too alkaline (high pH) can seriously corrode the sewer system and affect the wastewater treatment facility's ability to treat the wastewater, so the pH must be controlled.
 - **Temperature:** High temperature brewery wastewater can cause issues at wastewater treatment plants. Check with your WWTF for limits.
- 2. Apply for authorization, if needed:** Depending on how you manage your wastewater, the size of your brewery and the WWTF, you may be required to obtain a discharge permit from your local municipality. Approval from NHDES is required prior to obtaining a local discharge permit. Contact your WWTF or NHDES' Industrial Pretreatment Coordinator at (603) 271-2052 for additional information.
- 3. Install a monitoring point, if needed:** To ensure their wastewater meets requirements, breweries may be required by their municipality to have an easily accessible monitoring point. They must be



able to collect samples that represent the discharge from the brewing operation in a location that is separate from sanitary and restaurant drains. (See Figure 1) While small breweries may not always have a separate monitoring point, your municipality reserves the authority to require one and it is generally recommended. It's better to plan ahead for growth, rather than to incur the cost of remodeling and upgrading plumbing.

Figure 1: Monitoring point is needed to sample brewery wastewater only, not other sources of wastewater.



The BMPs

The following BMPs are recommendations to help large and small breweries meet requirements. Small breweries may be able to meet requirements without implementing every BMP.

Solids Management

Brewery operations must maintain compliance with local limits.

Tips for limiting suspended solids:

- Install screens, filters or baskets on all floor drains and trenches to capture solids.
- Prevent spent yeast, grains, hops, and trub from entering the sewer. Collect them from all filters, mash tuns, whirlpools, and kettles by settling, straining, screening or filtering them.
- Use the correct gauge screen to maximize solids removal and install screens that are easy to access and service.
- Dewater collected solids & dispose off-site. Consider beneficial reuse.
- Collect spent yeast slurry for offsite disposal or beneficial reuse. If possible, reuse the yeast for multiple generations. This is important because spent yeast from fermentation/maturation tanks has high nutrient and high solids content. Large quantities of yeast lead to organic acids formation, which affects the pH making the wastewater more acidic.
- Collect used filter media (e.g. diatomaceous earth) and dispose off-site or consider beneficial reuse.
- Control solids at the source; don't let the solids hit the ground, sweep up and collect spills, and avoid rinsing them down the drain.
- Train employees on solids management practices.

Beneficial Reuse

When disposing solids offsite, consider beneficial reuse. Seek opportunities to turn your solids and high strength waste into compost, fertilizer, animal feed, energy, or other authorized beneficial reuse.

Control pH

In general, brewery wastewater is acidic. However, cleaning processes can cause high and low spikes. Brewery operations must maintain compliance with pH discharge limits.

Tips for maintaining compliance with the pH limits: (See Figures 2 and 3 at the end of this document)

- Install totes, tanks or containers to adjust the pH of individual waste streams.
- Install a sufficiently sized tank to collect wastewater from all brewery operations for the purpose of self-neutralization and if necessary to adjust the pH to meet these limits.
- For small batches with slight excursions above upper pH limits, mild acids such as acetic acid (i.e., vinegar) or citric acid can be used to neutralize the wastewater.
- For small batches with slight excursions below lower pH limits, mild alkaline solutions, such as calcium carbonate (lime) can be used to neutralize the wastewater.
- Stronger acidic or alkaline neutralization chemicals may be needed based on the pH and the volume of the wastewater to be neutralized.
- Provide a mechanical mixer in the wastewater tank to make sure adequate mixing occurs when using neutralizing chemicals.
- Reuse and recycle chemicals wherever possible through automated approaches (e.g., clean in place).
- Train employees on pH management practices.

Product Losses/Off-Spec Product

Sending excessive amounts of high strength waste to the sewer can disrupt the sewer system and/or increase your high strength surcharge fees. Minimize the volume of unused and off-spec product discharged to the public sewer whenever possible. If there is no other alternative than the sewer, the discharge still must meet local limits. In addition to collecting spent yeast, grains, hops and trub, collect the following high strength wastes and dispose off-site if possible.

Collect the following for beneficial reuse or disposal offsite:

- Off-spec and unused beer/product.
- Tank heels and initial rinse of brew tanks.
- Beer & yeast lost in racking and transfer.
- Beer lost in filtering, bottling, & kegging.

Chemical Storage and Spill Prevention

Provide secondary containment for chemical solutions such as cleaning and sterilization chemicals and waste materials to prevent the entry of these materials into the sewage system in case of accidental spills. Reduce use of toxic chemicals whenever possible.

- Store chemical solutions in low traffic areas, away from forklifts and other production activities, to lessen the chance of an accidental spill.
- Segregate and securely store non-compatible chemicals (for example acids and bases) in separate containment areas to prevent mixing of incompatible or reactive materials.
- Maintain and inspect all process solution tanks on a regular basis and repair any leaks promptly.
- Label all chemical solution storage containers.
- Develop a spill response plan and train employees to follow the spill plan. Post the spill plan and the contact information for spill notification in a prominent place. **The plan should at a minimum:**

- o Describe where chemicals are stored, how liquids are stored and handled to prevent and isolate spills, and transfer protocols.
- o Describe how staff will respond to a spill, including immediate notifications to emergency responders
- o Describe staff training required to respond to spills safely and effectively. o Update the plan as your processes change.

Records

Keep records to document your facility's compliance with requirements.

- Maintain records documenting off-site waste removal including waste stream, volume, date, and method of disposal of accumulated wastes.
- Maintain records of all effluent sample results collected to determine compliance with local limits.
- Retain records on site for a minimum of three years, or as required by your municipality.

Considerations When Planning for New or Remodeled Operation

Avoid expensive mistakes! When working on your facility layout, retain the services of an engineer experienced in design of brewery wastewater treatment systems and consider the following:

- All drains from brewing operations should lead to a common drain, sump or wastewater tank where the wastewater can be accessed and managed to ensure compliance with discharge limits.
- Control of pH is often necessary, and batch treatment to meet pH limits is still the best option for many small breweries. Necessary features typically include a tank, mixer, pH meter in tank (to control neutralizing chemicals), continuous pH meter (for the discharge), and a delivery system for the acids and bases used for neutralization. (See Figures 2 and 3 at the end of this document)
- Set aside sufficient floor space for a wastewater pH equalization/treatment tank, treatment chemical containers, and solids handling equipment and storage.
- Provide an easily accessible sample site that is representative of the discharge from the brewing operation, separate from sanitary and restaurant drains. (See Figure 1).
- Consider the method(s) and/or equipment you will use to measure wastewater discharge volume from the brewing operation.

Water Conservation

Conserving water can reduce wastewater and save money. Ways to conserve water include:

- Monitor your water usage by installing water meters in various areas of the operation; establish a baseline and set water saving goals.
- Use dry clean-up procedures prior to wet clean-up.
- Use water-efficient equipment, such as high pressure nozzles, clean-in-place systems, and water brooms. Find alternatives to water-cooled chilling equipment.

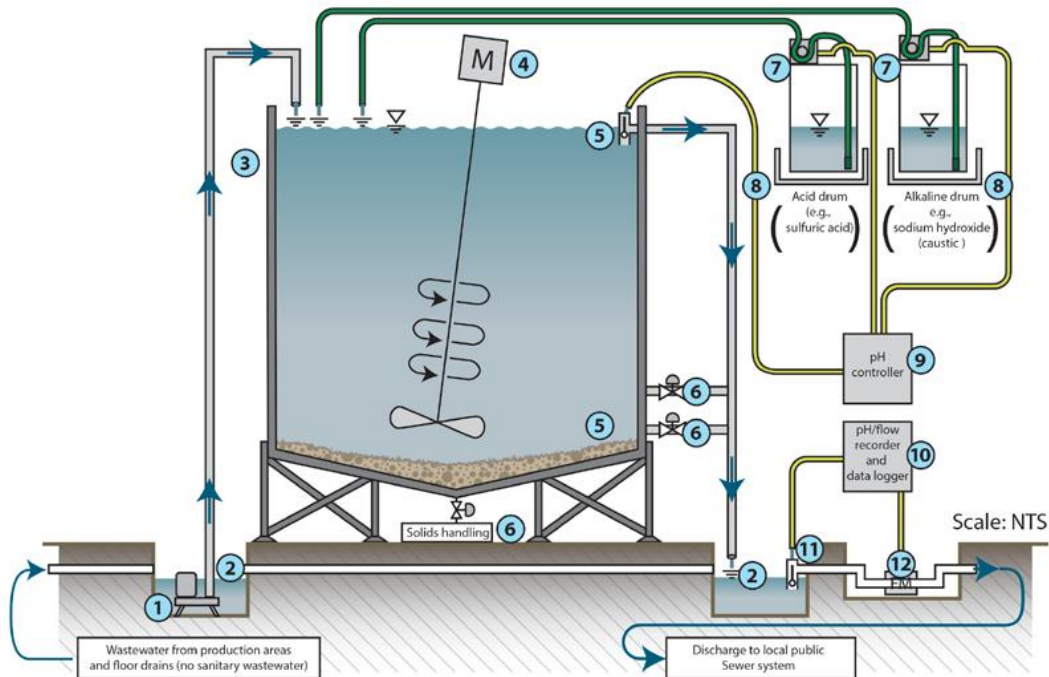
Additional examples of water conservation BMPs can be found in such documents as the [Brewers Association's Water and Wastewater: Treatment/Volume Reduction Manual](#). (Free to members)

Please refer to the following pages for diagrams showing a schematic for pH neutralization for flow-through and multiple batch and a schematic for pH neutralization for single batch.



Figure 2: pH neutralization for flow-through or multiple batch

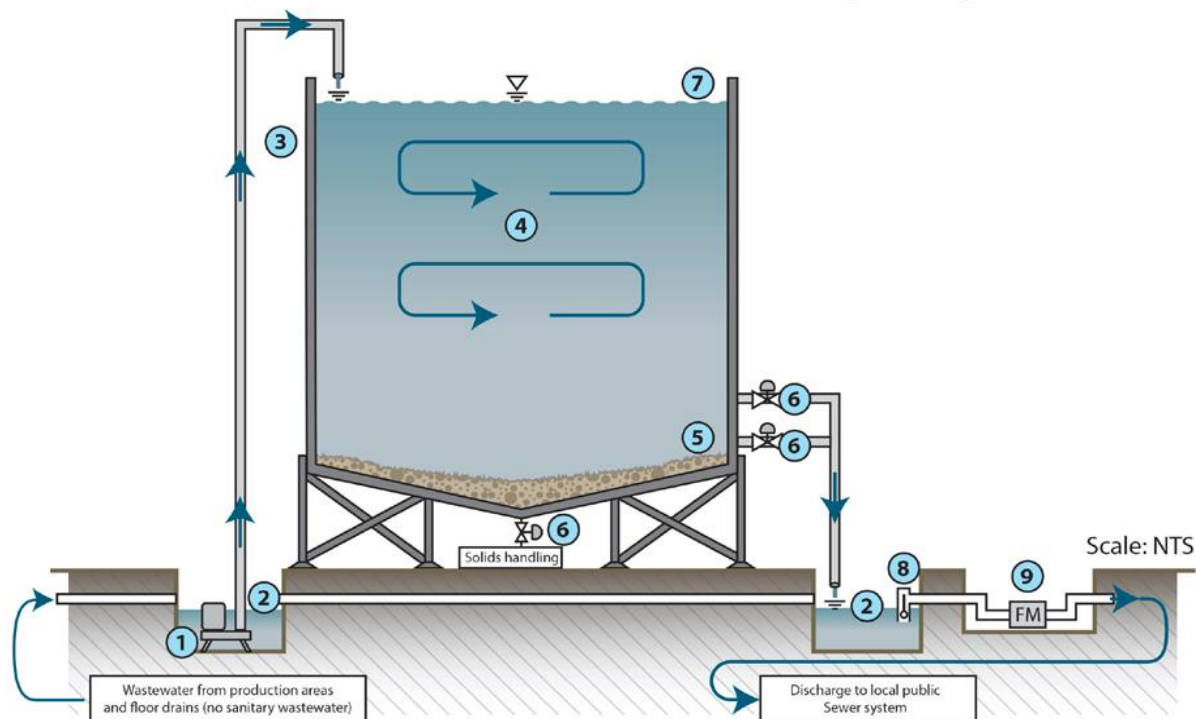
Brewery Wastewater BMP Guidance -
Example pH Neutralization Schematic - Flow-Through or Multiple Batch



- ① Sump pump(s) with level controls set to prevent gravity overflow through the sewer outlet under peak flow conditions from the production area. Check valve and flow control valve not shown.
- ② Sump or lift station with protective grating.
- ③ Tank for self-neutralizing of acidic and alkaline industrial wastewater and for adjusting pH by addition of concentrated neutralizing chemicals. Conical tank with stand shown. A flat-bottom tank can be used as well, but solids handling is a bit more labor-intensive. The piping and valving shown allows for the tank to be operated in flow-through mode through the upper overflow line or in batch decant mode through the lower decant lines.
- ④ Mechanical mixer with impeller or propeller blades to facilitate the neutralizing of acidic and alkaline industrial wastewaters. Mixer should be set at a slight angle and sized to turnover the tank volume at least a few times within the hydraulic retention time. Mixer mounting not shown to provide clarity to the schematic and as styles vary.
- ⑤ Controlling pH probe used, along with the pH controller (9), to regulate the delivery of neutralizing chemicals to the tank. The controlling pH probe can be moved to other locations within the particular tank geometry and experience with what works best for stable pH control. For discharges in batch mode, the controlling pH probe needs to be located where it can be constantly submerged.
- ⑥ Valves in a normally-closed position. Side decant valves to be opened when decanting the neutralized and clarified tank wastewater in batch decant mode. Tank bottom valve to be opened for removal of settled solids or for tank cleaning.
- ⑦ Chemical metering pump integrated with the controlling pH probe (5) through the pH controller (9). pH setpoints established to deliver acidic or alkaline concentrated neutralizing chemicals with a sufficient safety factor to ensure that the discharge pH probe (11) remains within local discharge limits.
- ⑧ Separate secondary containment for the concentrated acid and alkaline neutralizing chemicals.
- ⑨ pH controller integrated with the controlling pH probe (5) and chemical metering pumps (7).
- ⑩ pH and flow recorder and datalogger connected to the discharge pH probe (11) and flow meter (12) to monitor the pH and volume of the industrial wastewater discharged to the sanitary sewer. Any sanitary wastewater (e.g., restrooms, etc.) must enter downstream from the discharge pH probe (11) and flow meter (12).
- ⑪ Discharge pH probe positioned in a vented "T" to allow for ease of access and to remain constantly submerged.
- ⑫ Flow meter in valve box or other suitable structure with protective grating. The meter is to be installed per manufacturer's instructions and have datalogging capability. Ability for the flow meter to integrate with an autosampler to collect flow-proportioned samples also may be required for large volume dischargers.

Figure 3: pH neutralization for a single daily batch

**Brewery Wastewater BMP Guidance -
Example pH Neutralization Schematic - Single Daily Batch**



- ① Sump pump(s) with level controls set to prevent gravity overflow through the sewer outlet under peak flow conditions from the production area. Check valve and flow control valve not shown.
- ② Sump or lift station with protective grating.
- ③ Tank for self-neutralizing of acidic and alkaline industrial wastewater and for adjusting pH by addition of concentrated neutralizing chemicals. Wastewater to be collected for an entire workday to allow for batch treatment and discharge at the end of the workday. Conical tank with stand shown. A flat-bottom tank can be used as well, but solids handling is a bit more labor-intensive. The piping and valving shown allows for the tank to be operated in batch decant mode through the lower decant lines.
- ④ Use a mechanical mixer or hand paddle (for small tanks) to facilitate the neutralizing of acidic and alkaline industrial wastewaters.
- ⑤ Test wastewater batch with a pH probe to regulate the delivery of neutralizing chemicals to the tank. The pH probe needs to be located where it can be constantly submerged.
- ⑥ Valves in a normally-closed position. Side decant valves to be opened when decanting the neutralized and clarified tank wastewater in batch decant mode. Tank bottom valve to be opened for removal of settled solids or for tank cleaning.
- ⑦ Neutralizing chemicals to be added manually or with aid of a chemical metering pump.
- ⑧ Discharge pH probe positioned in a vented "T" to allow for ease of access and to remain constantly submerged during batch discharge.
- ⑨ Flow meter in valve box or other suitable structure with protective grating. The meter is to be installed per manufacturer's instructions and have datalogging capability.

NOTE: This guidance document was originally developed by King County, Washington Wastewater Treatment Division. With their permission, it has been adapted by NHDES to reflect New Hampshire rules and requirements.